



Complete Summary

GUIDELINE TITLE

Diagnosis of chest pain.

BIBLIOGRAPHIC SOURCE(S)

Institute For Clinical Systems Improvement (ICSI). Diagnosis of chest pain.
Bloomington (MN): Institute For Clinical Systems Improvement (ICSI); 2002 Oct.
50 p.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
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SCOPE

DISEASE/CONDITION(S)

Chest pain

- Typical angina
- Atypical angina
- Nonanginal chest pain

GUIDELINE CATEGORY

Diagnosis
Risk Assessment

CLINICAL SPECIALTY

Cardiology
Emergency Medicine
Family Practice
Internal Medicine

INTENDED USERS

Advanced Practice Nurses
Allied Health Personnel
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To improve the timeliness of evaluation of patients presenting with chest pain symptoms
- To increase the success of emergency intervention for patients with high-risk chest pain
- To improve the diagnostic value of stress tests through their appropriate use in patients with chest pain symptoms

TARGET POPULATION

Adults greater than age 18 presenting with past or present symptoms of chest pain/discomfort

INTERVENTIONS AND PRACTICES CONSIDERED

Diagnosis

1. Initial contact triage for high-risk symptoms of chest pain, assessment of risk for adverse outcomes
2. Emergency department (ED) or clinic evaluation of symptoms
3. History and physical examination
4. Diagnostic testing as indicated
 - Cardiac monitoring
 - Resting electrocardiogram (ECG)
 - Laboratory testing, such as cardiac markers (serum troponin, myocardial muscle creatine kinase isoenzyme [CK-MB], arterial blood gases [ABGs]), and hemoglobin
 - Chest x-ray (CXR)
 - Cardiac stress testing including standard exercise treadmill, exercise imaging testing (echocardiography, myocardial perfusion imaging) and pharmacological imaging stress testing (with adenosine, dipyridamole, or dobutamine)
5. Use of American Heart Association-Advanced Cardiac Life Support (ACLS) protocols
6. Use of Chest Pain Unit (CPU) or Chest Pain Pathway
7. Specialist consultation, as indicated

Emergency Management of High-Risk Chest Pain

1. Initial emergency room interventions, such as starting intravenous (IV) line, oxygen administration, and administration of chewable aspirin (ASA)

2. Additional interventions (depending on diagnosis symptoms suggest), such as: heparin plus or minus nitroglycerin (NTG) and/or beta blockers for symptoms suggestive of coronary artery disease (CAD), followed by thrombolytic therapy as appropriate; chest tube for symptoms suggestive of pneumothorax, etc.

MAJOR OUTCOMES CONSIDERED

- Validity of risk assessment measures
- Diagnostic/prognostic value of stress tests
- Timeliness of evaluation of patients presenting with chest pain symptoms
- Success of emergency intervention for patients with high-risk chest pain, as measured by morbidity and mortality

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Committee)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Review
Review of Published Meta-Analyses

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not applicable

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

The cost of admission to the hospital for unstable angina pain is high. Further, only about 50%-60% of patients admitted with this diagnosis have a dismissal diagnosis of an acute coronary syndrome. In spite of the high admission rate, emergency departments (EDs) inadvertently dismiss 2%-5% of acute myocardial infarctions (MIs) because of atypical presentations and normal or non-diagnostic ECG changes. This dilemma has in recent years forced development of more cost-effective ways to manage chest pain patients. ED-based chest pain units and hospital-based critical pathways for management of chest pain have been shown to provide this service at a significant reduction of cost and resources. To date published literature (see references in the original guideline document) provides strong support for the safety and cost effectiveness of these programs for low- and low-intermediate-risk patients (per AHCPR criteria). The CHEER study at Mayo has also shown safety and cost effectiveness in patients at intermediate risk for short-term MI or death.

METHOD OF GUIDELINE VALIDATION

Clinical Validation-Pilot Testing
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Institute Partners: System-Wide Review

The guideline annotation, discussion and measurement specification documents undergo thorough review. Written comments are solicited from clinical, measurement, and management experts from within the member groups during an eight-week review period.

Each of the Institute's participating member groups determines its own process for distributing the guideline and obtaining feedback. Clinicians are asked to suggest modifications based on their understanding of the clinical literature coupled with their clinical expertise. Representatives from all departments involved in implementation and measurement review the guideline to determine its operational impact. Measurement specifications for selected measures are developed by the Institute for Clinical Systems Improvement (ICSI) in collaboration with participating member groups following implementation of the guideline. The specifications suggest approaches to operationalizing the measure.

Guideline Work Group

Following the completion of the review period, the guideline work group meets 1 to 2 times to review the input received. The original guideline is revised as necessary and a written response is prepared to address each of the responses received from member groups. Two members of the Cardiovascular Steering

Committee carefully review the input, the work group responses, and the revised draft of the guideline. They report to the entire committee their assessment of four questions: (1) Is there consensus among all ICSI member groups and hospitals on the content of the guideline document? (2) Has the drafting work group answered all criticisms reasonably from the member groups? (3) Within the knowledge of the appointed reviewer, is the evidence cited in the document current and not out-of-date? (4) Is the document sufficiently similar to the prior edition that a more thorough review (critical review) is not needed by the member group? The committee then either approves the guideline for release as submitted or negotiates changes with the work group representative present at the meeting.

Pilot Test

Member groups may introduce the guideline at pilot sites, providing training to the clinical staff and incorporating it into the organization's scheduling, computer and other practice systems. Evaluation and assessment occurs throughout the pilot test phase, which usually lasts for three-six months. At the end of the pilot test phase, ICSI staff and the leader of the work group conduct an interview with the member groups participating in the pilot test phase to review their experience and gather comments, suggestions, and implementation tools.

The guideline work group meets to review the pilot sites' experiences and makes the necessary revisions to the guideline, the Cardiovascular Steering Committee reviews the revised guideline and approves it for release.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The recommendations for the diagnosis of chest pain are presented in the form of an algorithm with 89 components, accompanied by detailed annotations. Algorithms are provided for: [Screening](#), [Emergency Intervention](#), [Clinic Evaluation](#), and [Non Cardiac Causes](#); clinical highlights and selected annotations (numbered to correspond with the algorithm) follow.

Class of evidence (A-D, M, R, X) ratings are defined at the end of the Major Recommendations field.

Clinical Highlights

1. On initial contact with the healthcare system, high risk patients need to be identified quickly and referred to an emergency room (ER) via the 9-1-1 system. (Annotations #1, 2, 4, 5, 6,8, 10-14)
2. Patients whose chest pain symptoms are suggestive of serious illness need immediate assessment in a monitored area of the emergency room and early therapy to include an intravenous line (IV), O₂ (oxygen), and an aspirin (ASA). (Annotation #17)
3. Triage and management of patients with chest pain and unstable angina must be based on a validated risk assessment system (i.e. American College of Cardiology [ACC]/American Heart Association [AHA] criteria). (Annotation #27)

4. Patients with high-risk features need to be identified quickly and treatment instituted in a timely fashion. (Annotations #27, 30, 31, 32)
5. Patients with low-risk symptoms should be evaluated as outpatients in a timely fashion. (Annotations #27, 28, 29)
6. Treadmill test results should be reported using the Duke Treadmill Score, based on the Bruce Protocol. (Annotations #37, 65, 66)

Screening Algorithm Annotations

1. Initial Contact with Complaint of "Chest Pain/Discomfort" in Person or Via Telephone

Initial presentation may be in person or on the phone, etc.

Definitions:

Chest: Upper abdomen, chest, upper back, throat, jaw, shoulders, upper arms

Pain: "Discomfort" or other abnormal sensation such as "gas," "indigestion," "fullness," "pressure," "tightness," or "heaviness"

2. Receptionist Screen Benign?

The purpose of the initial chest pain screen is to route most inclusively all but those with negligible or no risk for cardiovascular compromise/death to immediate medical triage. This applies to initial contact with a receptionist or other non-medical personnel. It is important to systematically train personnel to recognize chest pain risk markers.

If any of the following are true, the patient should be directed to medical personnel:

- Patient is having pain now.
- Interviewer senses the patient is in distress.
- The onset of symptoms was within the past 8 weeks prior to call.
- Pain was at least moderate.
- Patient is having other symptoms of ill health.
- Patient requests an immediate opportunity to discuss with medical personnel.

Instruct the appropriate personnel in conducting the initial screen.

Evidence supporting this recommendation is of class: D

4. Brief Screening History by Medical Personnel

For the purposes of this guideline, the following definitions will be used to categorize the patient's chest pain or discomfort as a symptom complex and not an etiology:

Typical angina pain or discomfort that is 1) substernal, 2) provoked by exercise and/or emotion, and 3) relieved by rest and/or nitroglycerin (NTG).

Atypical angina pain or discomfort that has two of the three features listed for typical angina.

Nonanginal chest pain or discomfort that has one or none of the three features listed for typical angina.

High-Risk Symptoms

Symptoms suggestive of a high risk of immediate adverse outcome include, but are not limited to:

- Severe or ongoing pain
- Pain lasting 20 minutes or more
- New pain at rest or with minimal activity
- Severe dyspnea
- Loss of consciousness

The interviewer may use his/her discretion with respect to the need to obtain further history for such symptoms or refer to a physician.

All patients with chest pain should be instructed on the proper use of 911 and how to contact their clinic for worsening symptoms.

The interviewer must use his or her judgment. If in the judgment of the interviewer the patient is at high risk for serious illness, the patient should be considered to have "high-risk symptoms." This guideline focuses on serious complaints which the interviewer feels may signify a serious illness. Chest pain which is not high risk in the judgment of the interviewer (e.g., a young person with chest wall pain) may be evaluated in the office.

Teach medical triage personnel to appropriately conduct the brief screening history.

Evidence supporting this recommendation is of classes: M, R, X

5. High-Risk Symptom(s) Present at Time of Call

High-risk symptoms(s) at the time of contact identify a group of patients at high risk for a coronary event.

Evidence supporting this conclusion is of class: R

6. High-risk Symptom(s) Present Within Last 2 Days

Patients who have had high-risk symptom(s) within the previous two days are at the highest risk and should enter the 911 system. The interviewer may judge the need for ambulance transport and office or emergency department

(ED) evaluation for patients who call hours or days after transient symptoms resolve.

Evidence supporting this conclusion is of class: R

8. High-Risk Symptoms(s) Present Between 3 days and Last 2 Weeks

Patients who have had high-risk symptom(s) within the previous two weeks but not the previous two days may be safely evaluated in either a properly equipped office or the ED.

Evidence supporting this conclusion is of class: R

10. High-Risk Symptoms(s) Present Between 2 Weeks and 2 Months

High-risk symptom(s) within two months of the initial evaluation but not within two weeks identify a group of patients at lower risk for immediate adverse outcome. These patients can be evaluated in the office within three days.

Evidence supporting this conclusion is of class: R

11. Clinical Evaluation Within 72 Hours

Patient education directed toward use of 911 and recognition of signs and symptoms of an advancing coronary event should occur at this point.

Evidence supporting this conclusion is of class: R

12. High-Risk Symptoms(s) Present More Than 2 Months Ago

Patients who have been stable without high-risk symptoms for the previous two months can be seen as a routine appointment.

Evidence supporting this conclusion is of class: R

14. Clinic Evaluation Same Day

If the severity and/or duration of the chest pain symptoms cannot be determined in the phone interview, the patient should be seen on the same day in the office or the ED.

[Emergency Intervention Algorithm Annotations](#)

16. Ambulance Transport to ED

A patient complaining of chest pain suggestive of serious etiology should be transported via ambulance with Advanced Cardiac Life Support (ACLS) capabilities whether he/she is being transported from home or outpatient clinic to the ED.

Patients who are critically ill or unstable should be taken to a hospital capable of performing cardiac catheterization and cardiac surgery unless this would lead to excessive transport time. Plans for triage of a critically ill patient to a tertiary care institution should be part of every community hospital plan.

If a patient is seen in a clinic or physician's office complaining of chest pain suggesting a serious condition, the patient must be transported to the ED as soon as possible. Attempts should be made to stabilize the patient as well as possible prior to transport. The referring physician must call the receiving physician and send copies of all medical records pertaining to the current illness.

17. Immediate Assessment with Cardiac Monitoring

On arrival in the ED, a patient complaining of chest pain should immediately be placed on a cardiac monitor, vital signs taken IV line started, oxygen (O₂), immediate electrocardiogram (ECG) obtained, and cardiac markers drawn. Troponin I or T have been proven to be very sensitive and specific for myocardial injury as well as predictive of short-term risk for myocardial infarction (MI) or death. Myocardial muscle creatine kinase isoenzyme (CKMB) should no longer be used as the primary marker for MI, but can be useful in assessing the timing of the event. It may also be useful in patients with renal failure who also have an elevated troponin. Interpretation of an abnormal serum troponin (or CKMB) is dependent upon the clinical setting in which the myocardial injury occurred. A portable chest x-ray (CXR) may be performed if indicated. The ED physician should also be called to the patient's bedside immediately.

On arrival, the physician should perform a brief initial assessment based on vitals, brief historical information, and physical examination. Institution of stabilizing therapy (including chewable ASA for suspect anginal pain) prior to completing history or physical is appropriate and often necessary at this level.

Supplemental oxygen is generally applied during ambulance transport, and should be continued in the ED. Temporarily withholding oxygen in order to obtain blood gases on room air for diagnostic purposes is sometimes helpful.

18. Vital Signs Compromised?

In the critically ill patient whose vitals are compromised (i.e., cardiac arrest, tachyarrhythmias, severe bradycardia, shock or hypotension), the Advanced Cardiac Life Support (ACLS) guidelines developed by the American Heart Association should be followed.

19. Initiate ACLS Protocols

The American Heart Association-Advanced Cardiac Life Support guideline provides the most recent protocols for initial management of patients whose vital signs are compromised. ED personnel are recommended to remain current by attending these courses at recommended intervals.

20. Symptoms Suggest Possible Coronary Artery Disease?

The symptoms that suggest coronary artery disease (CAD) are, in order of importance:

1. Chest pain description (see Annotation #4)
2. Evidence of prior MI
3. Gender (often atypical presentation in females)
4. Age
5. Presence of risk factors for atherosclerosis

The description of the patient's chest pain or discomfort is the most critical part of the history. Although multiple other features of the chest pain may be incorporated into an experienced clinician's judgment, the clinician should ultimately attempt to classify the patient as having typical angina, atypical angina, or nonanginal chest pain as described in Annotation #4 of the Screening Algorithm.

Evidence supporting this recommendation is of classes: C, M

21. ECG Diagnostic of Acute MI?

The recognition of CAD and evaluation of its severity cannot be adequately carried out without an ECG. The early performance of an ECG following arrival at the emergency room is therefore critical. When patients have new or presumably new ST elevation of greater than 1 mm in two contiguous leads, they should be considered to have acute MI. Patients with new or presumably new left bundle branch block (LBBB) should be treated similarly to those with ST segment elevation. Although some patients with LBBB will prove not to have acute MI, thrombolytic therapy of patients with LBBB is nevertheless associated with a reduction in patient mortality.

Evidence supporting this recommendation is of classes: A, C

22. Initial Therapy

Aspirin (ASA) reduces mortality, reinfarction, and stroke. Although the incremental value of heparin in conjunction with ASA and reperfusion therapy is controversial, it does appear to enhance patency, and was included in the GUSTO protocol. In eligible patients, beta blockers reduce mortality, reinfarction, and stroke. Although long-acting nitrates (oral and IV) appeared to reduce mortality in trials that did not include thrombolysis, more recent studies that did include thrombolysis found no incremental benefit from nitrate therapy. Nitrate therapy is still appropriate for ischemic pain relief. Although the routine use of calcium channel blockers is not recommended, special circumstances may warrant their consideration. For detailed discussion, refer to the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement's (ICSI) [Treatment of Acute Myocardial Infarction](#).

Evidence supporting this recommendation is of classes: A, C, M, R

23. Thrombolytic Candidate?

Thrombolytic therapy should be initiated as soon as possible in eligible patients. Eligibility criteria and contraindications are listed in table 1 of the original guideline. Although advanced age is a relative contraindication to thrombolytic therapy, the benefits appear to outweigh the risks in many elderly patients.

24. Choose and Administer Thrombolytic Agent

The choice of thrombolytic agent (e.g., Reteplase, streptokinase, tissue plasminogen activator [tPA]) is a controversial topic, which has been reviewed by the Minnesota Health Technology Advisory Committee (HTAC) and left to the judgment of the physician. For detailed discussion, see the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement's (ICSI) [Treatment of Acute Myocardial Infarction](#).

The goal for time of arrival to the ED to time of administration of thrombolytics ("time to needle") should be less than 30 minutes.

Evidence supporting this recommendation is of classes: A, R

25. Consider Percutaneous Transluminal Coronary Angioplasty (PTCA)

Direct angioplasty is superior to thrombolytic therapy with respect to infarct size reduction, late ejection fraction, recurrent ischemia, mortality, and recurrent infarction, when performed in a timely fashion by an experienced operator. Additionally, direct angioplasty should be considered in any patient with an ECG diagnostic of ST elevation MI who has contraindications to thrombolytic therapy. This may require emergency transfer of the patient to another hospital where direct angioplasty is available. The expense and difficulty of such a transfer must be weighed against the potential benefit to the patient. Patients with anterior MI and patients who present very early (less than four hours) in the course of infarction should derive the greatest benefit from acute reperfusion with angioplasty.

The goal for time of arrival to the ED to time of presentation to cath lab for percutaneous transluminal angioplasty should be less than 60 minutes. For patients who are not candidates for thrombolytic therapy, initial medical therapy with ASA, heparin, NTG and beta blockers should be given; additionally, the use of a IIb/IIIa IV platelet inhibitor should be considered.

Evidence supporting this recommendation is of class: A

26. Admit Coronary Care Unit (CCU)/ Intensive Care Unit (ICU)

Such a unit should have the highest level of medical care available in the hospital, including a high nurse-to-patient ratio, cardiac monitoring, personnel trained in advanced cardiac life support, and technical capabilities, including arterial lines, pulmonary artery catheters, temporary pacemakers, and mechanical ventilation.

27. Risk Assessment (American College of Cardiology [ACC]/American Heart Association [AHA] criteria)

Patients with stable angina may be safely evaluated as outpatients. These will include some patients with slight progression of their symptoms, which may reflect non-compliance with medications, increasing activity, emotional stress, or other exacerbating factors. Patients with a low likelihood of CAD on the basis of chest pain description, age, gender and risk factor assessment, and patients at intermediate likelihood who have not had rest symptoms that are prolonged or accompanied by shortness of breath or other worrisome features, should also be considered stable.

For patients whose angina does not seem stable, it is important to use objective risk assessment criteria for purposes of triage (CCU, monitored bed or dismissal with follow-up). This guideline endorses the criteria published by the ACC/AHA in 2002 "ACC/AHA 2002 Guideline Update for the Management of Patients with Unstable Angina and Non-ST-segment Elevation Myocardial Infarction." These consist of a simple set of clinical variables to classify patients as high-, intermediate- or low-risk of death of MI.

Table 2: Likelihood that Signs and Symptoms Represent an Acute Coronary Syndrome (ACS) Secondary to Coronary Artery Disease (CAD)

Feature	High Likelihood Any of the following:	Intermediate Likelihood Absence of high-likelihood features and presence of any of the following:	Low Likelihood Absence of high- or intermediate-likelihood features but may have:
History	Chest or left arm pain or discomfort as chief symptom reproducing prior documented angina Known history of CAD, including MI	Chest or left arm pain or discomfort as chief symptom Age >70 years; Male sex; Diabetes mellitus	Probable ischemic symptoms in absence of any of the intermediate likelihood characteristics Recent cocaine use
Examination	Transient mitral regurgitation	Extracardiac vascular disease	Chest discomfort reproduced by

Feature	High Likelihood Any of the following:	Intermediate Likelihood Absence of high-likelihood features and presence of any of the following:	Low Likelihood Absence of high- or intermediate-likelihood features but may have:
	(MR), hypotension,		palpation
ECG	New, or presumably new, transient ST-segment deviation (≥ 0.05 mV) or T-wave inversion (≥ 0.2 mV) with symptoms	Fixed Q waves Abnormal ST segments or T waves not documented to be new	T-wave flattening or inversion in leads with dominant R waves Normal ECG
Cardiac markers	Elevated cardiac TnI, TnT, or CK-MB	Normal	Normal

Short-Term Risk of Death or Nonfatal MI in Patients with Unstable Angina (UA)

Feature	High Risk At least one of the following features must be present:	Intermediate Risk No high-risk feature but must have one of the following:	Low Risk No high- or intermediate-risk feature but may have any of the following features:
History	Accelerating tempo of ischemic symptoms in preceding 48 hours	Prior MI, peripheral or cerebrovascular disease or coronary artery bypass graft (CABG), prior aspirin	

Short-Term Risk of Death or Nonfatal MI in Patients with Unstable Angina (UA)			
Feature	High Risk At least one of the following features must be present:	Intermediate Risk No high-risk feature but must have one of the following:	Low Risk No high- or intermediate-risk feature but may have any of the following features:
		use	
Character of Pain	Prolonged ongoing (> 20 minutes) rest pain	Prolonged (< 20 minutes) rest angina, now resolved, with moderate or high likelihood of CAD Rest angina (< 20 minutes) or relieved with rest or sublingual nitroglycerin	New onset or progressive CCS Class III or IV angina the past 2 weeks without prolonged (> 20 minutes) rest pain but with moderate or high likelihood of CAD
Clinical findings	Pulmonary edema, most likely due to ischemia New or worsening MR murmur S ₃ or new/worsening rales, hypotension, bradycardia, tachycardia Age > 75 years	Age > 70 years	

Short-Term Risk of Death or Nonfatal MI in Patients with Unstable Angina (UA)			
Feature	High Risk At least one of the following features must be present:	Intermediate Risk No high-risk feature but must have one of the following:	Low Risk No high- or intermediate-risk feature but may have any of the following features:
ECG	Angina at rest with transient ST-segment changes >0.05 mV Bundle-branch block, new or presumed new Sustained ventricular tachycardia	T-wave inversions >0.2 mV Pathological Q waves	Normal or unchanged ECG during an episode of chest discomfort
Cardiac markers	Elevated (e.g., TnT or TnI >0.1 ng/mL)	Slightly elevated (e.g., TnT >0.01 but <0.1 ng/mL)	Normal

Adapted from Agency for Health Care Policy and Research (AHCPR, now known as the Agency for Healthcare Research and Quality, AHRQ) Guideline No 10 "Unstable Angina: Diagnosis & Management." May 1994

Complete certainty of the etiology of a patient's chest pain can commonly not be attained in the ED. It is therefore vitally important to assess risk in order to safely and yet cost-effectively triage chest pain patients. Further, it is important to recognize the difference between risk assessment and likelihood assessment in that likelihood assessment merely serves to communicate just that, while risk assessments may be used as a tool for clinical management.

Evidence supporting this recommendation is of class: B

28. Stable or Low Risk?

It should be emphasized that patients who are older than 65 years and patients with prolonged rest chest pain are not low risk (according to ACC/AHA criteria).

29. Discharge to Home/Outpatient Follow-Up

Provide the patient with instruction on follow-up care through her/his primary care physician (PCP). The primary care physician may want to follow the Clinic Evaluation Algorithm provided within this guideline.

Direct patient education toward use of 911 and recognition of signs and symptoms of an advancing coronary event should occur at this point.

30. Consider Early Therapy

All patients should receive chewable aspirin (160 to 324 mg) as soon as possible in the absence of absolute contraindications. The benefits of beta-blocker therapy, nitroglycerin, and intravenous heparin are well established. The use of calcium-channel blockers should be reserved for those patients whose symptoms remain refractory to these other therapies or for patients who have marked hypertension.

31. High-Risk?

High risk unstable angina patients require a high level of care with close monitoring and IV therapy, including Heparin beta blockade and nitroglycerin (NTG). This needs to be started in the ED setting. Hospitalization usually requires an Intensive Care Unit setting or competent nursing in a monitored bed setting. Details of in-hospital management are beyond the scope of this guideline.

32. Consider IIb/IIIa Inhibitors

Patients with high-risk (as defined in Table 2, Annotation 27) may benefit from receiving GP IIb-IIIa inhibitor (tirofiban HCl or eptifibatide) as part of initial treatment.

Patients with intermediate risk (as defined in Table 2) may benefit from GP IIb-IIIa inhibitor (tirofiban HCl or eptifibatide) if early invasive surgery is planned though this is still considered controversial. Early administration is preferred.

Early invasive strategy involves diagnostic catheterization within 24 to 48 hours, followed by PCI or CABG if warranted.

Contraindications to IIb/IIIa inhibitors include bleeding less than 6 weeks, intracranial hemorrhage (ever), recent stroke less than 2 years, uncontrolled hypertension greater than 200/100 mmHg, surgery less than 6 weeks, aortic dissection, acute pericarditis, platelets less than 100,000.

34. Use Chest Pain Unit (CPU) or Chest Pain Pathway

If the patient's risk assessment is not clearly in a high-or low-risk category and the institution has an ED-based chest pain observation unit, admission to this unit would be appropriate. Otherwise, management using a critical pathway for unstable angina with a similar protocol on a monitored bed unit is recommended.

A Chest Pain Unit/critical pathway provides monitoring capabilities, a dedicated Chest Pain Unit nurse, serial enzymes and a post-observation stress test prior to final triage decision. Generally, after successful completion of the evaluation patients can be classified as low risk and safely followed up as outpatients in the next 1-3 days. In the case of a positive or indeterminate lab test, ECG or stress/imaging test, or if there is recurrent chest pain during the observation period, a patient should be considered high risk and managed accordingly.

It should be emphasized that a patient who requires repeated doses of NTG and/or IV NTG or paste, or requires beta blockade for pain control should be considered high risk.

Refer to the table above in Annotation #27 for more information on risk stratification.

Evidence supporting this recommendation is of class: A

35. Observe for Minimum 6 Hours on Monitor

Chest Pain Unit protocols may vary somewhat from institution to institution. However, a minimum observation time of 6 hours is recommended as the sensitivity of cardiac enzymes is generally lower when measured earlier than 6 hours after the onset of pain. The patient should be placed on a cardiac monitor. An ECG and cardiac enzymes should be performed at least twice (at the beginning and at the end of the observation).

36. Patient Passed Observation and Reassessment?

The patient should be admitted to the hospital if, after reassessment, there is recurrence of chest pain, the cardiac enzymes are abnormal or diagnostic ECG changes occur, or the patient has a significant arrhythmia. Reassessment should also include repeat history.

37. Stress Test Passed?

A treadmill exercise test is preferred if the ECG is interpretable and the patient can exercise. A patient with a low-risk Duke treadmill score (see Annotation #65, Clinic Evaluation Algorithm) may be discharged. Patients with moderate- or high-risk score should be admitted. Patients with an uninterpretable ECG should undergo an exercise imaging test-- echocardiography or myocardial perfusion imaging. Patients who cannot exercise should undergo a pharmacological imaging test. Patients with a normal stress imaging study may be discharged. For detailed discussion, see the ICSI Cardiac Stress Test supplement.

Evidence supporting this recommendation is of class: C

38. Clinical Features Suggest Dissecting or Symptomatic Aneurysm?

Aortic dissection usually includes clinical findings of ischemia involving several different organ systems. The pain is typically tearing or ripping in nature. It will often radiate from the chest to the back, hips, and lower extremities. Hypertension, cardiac murmurs, systolic bruits, and diminished or absent pulses are all common findings. A chest x-ray may demonstrate abnormalities in the region of the aortic knob and an increase in diameter of the ascending aorta. In addition to chest pain, aneurysms may cause back pain, dysphagia, cough, and hoarseness. A discrepant blood pressure may be found between the right and left arm.

39. Diagnosis of Dissection/Immediate Magnetic Resonance Imaging (MRI) or Echo/Transthoracic and Transesophageal Echocardiography (TEE) if Available vs. Computed Tomography (CT) with Contrast

When it is readily available, and the patient is clinically stable, magnetic resonance imaging (MRI) is probably the single best imaging modality for the diagnosis of dissection. Transthoracic and transesophageal echocardiography are preferred in unstable patients who may not be able to cooperate for magnetic resonance imaging. Echocardiography may also be preferred in many institutions because of its generally greater availability, particularly outside regular working hours. Computed Tomography (CT) imaging may also be used in this setting.

Evidence supporting this recommendation is of classes: C, R

41. Arrange for Immediate Cardiovascular Surgery Consultation/Nitroprusside ± Esmolol Drip

Both symptomatic thoracic aneurysms and proximal (type A; ascending aorta) dissections have a poor prognosis with medical management. Surgical therapy is therefore recommended whenever the patient is a suitable operative candidate. In preparation for possible surgery, the blood pressure should be carefully controlled with IV nitroprusside and/or IV esmolol drip.

42. Symptoms, Arterial Blood Gases, Chest X-Ray Suggest Pulmonary Embolus?

Patients with acute pulmonary embolus present with varying symptoms. Clinical manifestations include dyspnea, tachypnea, and pleuritic chest pain. Findings upon physical examination also vary from no obvious signs to overt shock. Low grade fever may be present and wheezing may be heard on auscultation. An ECG may show non-specific abnormalities of the ST-T segment or T waves. Chest x-ray may reveal a small pleural effusion, but may more commonly be normal. Occasionally, a wedge-shaped infiltrate may be seen. Arterial blood gases (ABGs) typically reveal an abnormal A-a gradient.

44. Treatment of Distal Dissection

Patients with distal (type B; distal to left subclavian artery) aortic dissections can generally be stabilized with pharmacologic therapy. The aim of therapy with intravenous nitroprusside and intravenous esmolol drip is to control the patient's blood pressure and heart rate, and thereby eliminate the patient's pain and stabilize the dissection. If pharmacologic therapy is not effective, prompt surgery may be necessary. A cardiovascular surgical consult is therefore appropriate.

Evidence supporting this recommendation is of class: R

45. Symptoms, Arterial Blood Gases, Chest X-Ray Suggest Pneumothorax?

Idiopathic or spontaneous pneumothorax typically presents with sudden onset of pleuritic chest pain. A majority of patients will also complain of some degree of dyspnea depending on the size of the pneumothorax and the presence of other concomitant underlying disease. Typically, as the pneumothorax enlarges, the pleuritic component of chest pain diminishes and the degree of shortness of breath increases. Arterial blood gases may be helpful for the diagnosis of pneumothorax, but are not necessarily required. Arterial blood gases will often have been performed earlier to evaluate the possibility of pulmonary embolus.

46. Consider Chest Tube and Hospitalization

Patients with pneumothorax greater than 10-20% usually require a chest tube.

A patient with primary spontaneous pneumothorax can be observed on an outpatient basis when the clinician considers the risk minimal for progressive lung collapse. If the pneumothorax is secondary or associated with significant symptoms, the patient should be observed in the hospital. Outpatient management is only possible in the reliable patient. Close follow-up is mandatory.

Resolution of a spontaneous pneumothorax is very slow, with a 1.25% reabsorption per day. Alternative outpatient management modalities include catheter aspiration followed by several hours of in-hospital observation or evacuation of air by an indwelling catheter attached to a Heimlich flutter valve.

47. Symptoms, Signs Suggest Pericardial Disease?

Acute pericarditis usually presents with symptoms of chest discomfort. The discomfort characteristics are often variable and may be associated with dyspnea. Typically, the discomfort worsens with inspiration, coughing, position changes, or swallowing. Physical examination sometimes reveals a pericardial friction rub and the ECG may reveal ST-T wave changes.

Causes of acute pericarditis include infectious, neoplastic, metabolic and inflammatory autoimmune disorders. It can also be a result of MI (Dressler's syndrome). Drugs including hydralazine, procainamide, isoniazid, diphenylhydantoin, and doxorubicin have also been implicated in pericarditis. Blunt trauma to the chest and post-surgical etiologies should also be considered.

48. Tamponade?

A patient with cardiac tamponade will usually present with chest pressure/discomfort and shortness of breath. Physical examination will reveal an elevated jugular venous pressure and hypotension, tachypnea, and a narrow pulse pressure. Pulsus paradoxus of greater than 20 mm/Hg strongly suggests tamponade. ECG may reveal electrical alternans. Chest x-ray may be normal, but may also show an enlarged cardiac silhouette. Echocardiography is the diagnostic tool of choice for establishing the diagnosis of pericardial effusion, and may assist in the early diagnosis of pericardial tamponade.

49. Pericardiocentesis--Prefer ECHO Directed

Pericardiocentesis will relieve tamponade and can be life-saving. Echo-directed apical pericardiocentesis is the procedure of choice, resulting in reduced morbidity and mortality compared to the traditional blind approach. In the absence of echocardiography, the subxyphoid approach may be necessary in the unstable patient.

50. Admit CCU/ICU

The patient should be observed in an ICU/CCU setting.

52. Echo; Discharge?/Consider Treatment

In the patient with a working diagnosis of pericarditis without tamponade, obtain an echocardiogram. In the viral or idiopathic forms, NSAIDs or aspirin may be considered. Close follow-up is mandatory.

Clinic Evaluation Algorithm Annotations

54. History, Exam, ECG, Chest X-Ray, Office Labs

History should include characterization of pain, exacerbating or relieving factors, associated symptoms and risk factors for coronary disease. Physical exam should include careful cardiovascular and pulmonary exam, peripheral vascular exam, and evaluation for hypertension and hypercholesterolemia. Lab studies may include resting ECG, chest x-ray, hemoglobin, and others if clinically indicated.

The patient's description of pain (typical angina pectoris, atypical angina/chest pain, nonanginal chest pain see Annotation #4) and the history of previous coronary disease are by far the most important parts of the

history. Age, gender, and coronary risk factors (smoking, diabetes, hypertension, hyperlipidemia, and coronary disease before age 55 in fathers and brothers; 65 in mothers and sisters) are of progressively less importance.

Carotid bruits, peripheral vascular disease, and xanthomas on physical exam suggest a higher likelihood of coronary disease. The resting ECG may show evidence of previous infarction.

Direct provider education toward completing the history evaluation.

Evidence supporting this recommendation is of class: B

High-risk symptoms on initial presentation include:

History

1. Severe or ongoing pain
2. Pain lasting 20 minutes or more
3. New pain at rest or with minimal activity
4. Severe dyspnea
5. Loss of consciousness

Physical Findings

6. Hypotension or other signs of under-perfusion
7. Tachycardia or bradycardia
8. Pulmonary edema, cyanosis

Electrocardiogram (ECG) Findings

9. ST elevation greater than 1 mm on two contiguous leads suggesting acute MI
10. New ST or T wave changes
11. Widespread ST depression greater than 1 mm
12. New LBBB.

56. Initiate Emergency Interventions and Transfer to ED as Appropriate

Initiate emergency intervention as appropriate and transfer the patient as soon as possible for further emergency intervention.

A patient complaining of chest pain should immediately be placed on a cardiac monitor. Vital signs should be taken, IV line started, oxygen administered, and immediate ECG taken. The physician should be called to the patient's side immediately.

On arrival, the physician should perform a brief initial assessment based on vitals, brief historical information, and physical examination. Institution of stabilizing therapy (including NTG and chewable ASA for suspect anginal pain) prior to the completion of the history or physical is appropriate and often necessary at this level.

57. CAD Diagnosis Secure?

When the clinical setting and history suggest typical angina pectoris (substernal pain provoked by exertion and relieved by NTG or rest), the physician is very likely correct in assuming an ischemic coronary syndrome. Treatment and prognostic evaluation may proceed as outlined under the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement's (ICSI) [Stable Coronary Artery Disease](#).

Typical angina pectoris, stable for 60 days and without evidence of recent MI, may be treated under the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement's (ICSI) [Stable Coronary Artery Disease](#). Previously diagnosed coronary artery disease (e.g., old MI, Coronary Artery Bypass Graft [CABG]) with a stable symptom complex likewise may be treated under the NGC summary of ICSI's [Stable Coronary Artery Disease](#).

58. Refer to ICSI Stable CAD Guideline

Typical angina pectoris, if stable for 60 days and without evidence of recent myocardial infarction, may be treated under the NGC summary of ICSI's [Stable Coronary Artery Disease](#) guideline.

59. Ischemic Heart Pain Possible?

When coronary disease is a reasonable possibility and the clinician remains uncertain after evaluating the history, physical exam, and resting cardiogram, a stress test may contribute supplemental information. When coronary disease is unlikely based on highly atypical symptoms and low prevalence of coronary disease among the population to which the patient belongs, stress testing is best avoided. An abnormal test will be misleading.

Note:

For expanded discussion of Annotations 60-66, 70, 74, and 77 in this guideline, refer to ICSI's guideline [Cardiac Stress Test Supplement](#).

60. Choose Stress Test/Cardiology Referral Optional

Choose the best type of cardiac stress test based on:

1. The resting cardiogram
2. The patient's ability to walk
3. Local expertise

61. Can Patient Walk?

In patients who cannot exercise because of orthopedic or vascular limitations or because of debility, consider pharmacologic stress and imaging test (with adenosine, dipyridamole, or dobutamine). Selection of a pharmacologic test is best done after discussion with the cardiologist or imaging specialist.

62. Do Pharmacologic Imaging Study

Patient education directed toward preparing for and understanding the selected pharmacologic imaging study should occur at this point.

63. Resting ECG Interpretable?

Marked resting ECG abnormalities such as LBBB, LVH with repolarization abnormality, ventricular pre-excitation, or ventricular paced rhythm render the exercise ECG uninterpretable for ischemic changes. Patients on digoxin and those with less than 1 mm resting ST depression may undergo standard ECG stress testing, provided the clinician realizes that further ST depression with exercise has minimal diagnostic significance. A stable abnormality with exercise is reassuring.

Patient education directed toward preparing for and understanding the selected exercise imaging test should occur at this point.

64. Do Exercise Imaging Study

When the resting ECG is markedly abnormal, use an exercise imaging test (stress echo, stress radionuclear perfusion, stress radionuclear ventriculogram) based on local expertise and discussion with the cardiologist or imaging expert.

65. Do Regular Treadmill Stress Test

Use the Bruce protocol, modified if need be for debilitated patients. Elderly or debilitated patients receive a better exercise challenge on a more gradual protocol which avoids the large jumps between stages of the stress test. The ideal protocol allows a patient to walk 6-12 minutes.

Exercise should be symptom-limited or terminated because of clinical judgment rather than stopped at an arbitrary age-predicted maximum heart rate. Adequacy of exercise and myocardial challenge is generally accepted as achieving greater than or equal to 85% of age-predicted maximum heart rate.

Patient education directed toward preparing for and understanding the treadmill stress tests should occur at this point.

66. Is Treadmill Stress Test Strongly Positive?

Stress testing may be strongly positive and suggest a moderate to high risk of cardiovascular events as indicated by the Duke treadmill score, which is based upon the Bruce protocol.

A stress test predicts the patient's prognosis and provides evidence of the presence or absence of CAD. Of these two types of information, the first, establishing the patient's prognosis, is the more reliable.

Treadmill findings which signify a poor prognosis are:

1. Poor exercise tolerance
2. Hypotension (blood pressure falling below pre-exercise levels in patients with ECG, ischemia, or previous MI)
3. Marked ST abnormality at a low work load

Conversely, good exercise tolerance to a high heart rate and blood pressure signifies a good prognosis, even if the exercise electrocardiogram is somewhat abnormal. (For example, a patient who walks 9 minutes and has 1 mm of asymptomatic ST depression.)

Mark et al (Duke Treadmill Score) validated an easy-to-use treadmill score which stratifies high, intermediate, and low-risk patients:

Treadmill score = duration of exercise in minutes on the Bruce Protocol

-(minus) 5x maximal mm ST deviation

-(minus) 4x treadmill angina index

Treadmill Angina Index:

0 if no angina

1 if non-limiting angina

2 if limiting angina

High Risk = treadmill score less than -10
79% 4-year survival

Moderate Risk = treadmill score -10 to +4
95% 4-year survival

Low Risk = treadmill score greater than or equal to +5
99% 4-year survival

A Duke score of greater than 4 is generally accepted as a passing score, and such patients may be discharged to home with follow-up within 72 hours.

Evidence supporting this recommendation is of classes: B, C, R

Refer to Annotation Appendix A in the original guideline, "Nomogram of the Prognostic Relations Embodied in the Treadmill score."

67. Is Patient a Candidate for Revascularization?

Unless advanced age, co-morbidity, or patient preference suggests medical treatment, high-risk patients should be considered for revascularization.

Evidence supporting this recommendation is of classes: A, C

70. Is Test Positive but Low Risk?

A stress cardiogram may be positive but without features which signify a poor prognosis as noted above. For example, a 65-year-old man with atypical angina and 1.0 mm ST depression at 10 minutes has a good prognosis even though he has coronary disease.

71. Is Diagnostic Certainty Adequate?

A positive test may confirm the clinical diagnosis of coronary disease and allow treatment as outlined under the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement's (ICSI) [Stable Coronary Artery Disease](#).

Refer to cardiology if diagnostic certainty is critical.

Evidence supporting this recommendation is of classes: C, M

74. Is Test Equivocal?

Because of resting abnormality, limited exercise performance, limited heart rate, or minor exercise abnormalities, the test may not be clearly normal or abnormal, yet high-risk treadmill findings are absent.

Evidence supporting this recommendation is of classes: C, M

75. Is Diagnostic Certainty Adequate?

Knowing that the patient is not at high-risk may suggest empiric treatment or non-cardiac evaluation. Refer to cardiology if diagnostic certainty is important.

Evidence supporting this recommendation is of classes: C, M

77. Test is Normal

A normal test may confirm the clinical impression of non-cardiac symptoms. Refer to cardiology if symptoms are worrisome despite a normal stress test.

[Non-Cardiac Causes Algorithm Annotations](#)

83. Symptoms, Signs, Chest X-Ray Suggest Pleural or Parenchymal Pulmonary Disease?

Patients with pulmonary or pleural disease frequently have a presenting complaint of chest pain with or without shortness of breath. A detailed history, physical examination, ECG, chest x-ray and laboratory evaluation typically will often suggest the diagnosis. Differential diagnoses include

chronic obstructive pulmonary disease (COPD), asthma, infectious processes, and malignancies. Specific management of these diagnoses is beyond the scope of this guideline.

84. Evaluate for Admission

Disposition decisions are largely dependent on the patient's stability. The initial treatment must be directed toward treating any instability and searching for the etiology of the symptoms. Pulse, blood pressure, respirations and level of consciousness must be assessed. Other factors that need to be considered are age, general state of health and immuno-competency and reliability. If a patient is labile or unstable, or at risk of becoming unstable, admit the patient.

85. Symptoms and Signs Suggest Chest Wall/Costochondritis?

Costochondritis and intercostal strain frequently presents with chest pain. Typically, the patient is able to localize the discomfort to a fairly limited area. Physical examination should reveal reproducible pain at the site of the discomfort.

86. Nonsteroidal Antiinflammatory Drugs (NSAIDs)/Thermal Application/Follow-up PRN

Once the clinician has determined that the chest discomfort is indeed limited to the chest wall, treatment with nonsteroidal anti-inflammatory medication should be started and the patient should be advised on local application. Follow-up may be arranged as needed. For expanded discussion, refer to the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement's (ICSI) [Assessment and Management of Acute Pain](#).

87. Consider Gastrointestinal (GI) Diagnosis?

Gastrointestinal disorders are sometimes perceived by the patient as chest pain. Once the clinician is confident that no intra-thoracic processes are the cause of the discomfort, a gastrointestinal diagnosis should be considered.

88. Gastrointestinal Evaluation

Commonly history, physical examination, and a laboratory evaluation will suggest a gastrointestinal diagnosis. Further evaluation of this is beyond the scope of this guideline.

89. Reconsider Differential Diagnosis

If the clinician, after initial evaluation and work-up, does not arrive at a likely working diagnosis, he/she may have to go back and reconsider the entire differential diagnosis a second time in order to make certain that no serious condition has been missed. The clinician may then have to redirect his/her search for a diagnosis to conditions of the thoracic spine and thoracic nerves. Other considerations are somatization and anxiety disorders. These may be

more or less obvious after careful consideration. For anxiety diagnoses, refer to the National Guideline Clearinghouse (NGC) summary of the Institute for Clinical Systems Improvement's (ICSI) [Major Depression in Adults in Primary Care](#).

Definitions:

Evidence Grading System: Classes of Research Reports

A. Primary Reports of New Data Collection:

Class A:

- Randomized, controlled trial

Class B:

- Cohort study

Class C:

- Non-randomized trial with concurrent or historical controls
- Case-control study
- Study of sensitivity and specificity of a diagnostic test
- Population-based descriptive study

Class D:

- Cross-sectional study
- Case series
- Case reports

B. Reports that Synthesize or Reflect upon Collections of Primary Reports:

Class M:

- Meta-analysis
- Systematic review
- Decision analysis
- Cost-effectiveness analysis

Class R:

- Consensus statement
- Consensus report
- Narrative review

Class X:

- Medical opinion

CLINICAL ALGORITHM(S)

Detailed and annotated clinical algorithms are provided for the diagnosis of chest pain, including:

- [Screening](#)
- [Emergency Intervention](#)
- [Clinic Evaluation](#)
- [Non-Cardiac Causes](#)

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The guideline contains an annotated bibliography and discussion of the evidence supporting each recommendation. The type of supporting evidence is classified for selected recommendations (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

- Validation of risk assessment measures
- Improved timeliness of evaluation of patients presenting with chest pain symptoms
- Increased success of emergency interventions for patients with high-risk chest pain
- Improved diagnostic value of stress tests through their appropriate use in patients with chest pain symptoms

Subgroup(s) Most Likely to Benefit

Patients at high risk for death or nonfatal myocardial infarction (MI)

POTENTIAL HARMS

Side Effects of Thrombolytic Therapy

- Bleeding
- Allergic reaction

CONTRAINDICATIONS

CONTRAINDICATIONS

The Following are Relative Contraindications for Thrombolysis

- Prior stroke
- Active bleeding

- Systolic blood pressure ≥ 180
- Pregnancy
- Major surgery/trauma in the last 3 months
- Recent non-compressible vascular puncture
- Possible intracranial event or unclear mental status
- Previous use of streptokinase (a relative contraindication to repeat use)

Contraindications to IIb/IIIa Inhibitors

- Bleeding less than 6 weeks
- Intracranial hemorrhage (ever)
- Recent stroke less than 2 years
- Uncontrolled hypertension greater than 200/100
- Surgery less than 6 weeks
- Aortic dissection
- Acute pericarditis
- Platelets less than 100,000

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These clinical guidelines are designed to assist clinicians by providing an analytical framework for the evaluation and treatment of patients, and are not intended either to replace a clinician's judgment or to establish a protocol for all patients with a particular condition. A guideline will rarely establish the only approach to a problem.
- This clinical guideline should not be construed as medical advice or medical opinion related to any specific facts or circumstances. Patients are urged to consult a health care professional regarding their own situation and any specific medical questions they may have.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

Once a guideline is approved for release, a member group can choose to concentrate on the implementation of that guideline. When four or more groups choose the same guideline to implement and they wish to collaborate with others, they may form an action group.

In the action group, each medical group sets specific goals they plan to achieve in improving patient care based on the particular guideline(s). Each medical group shares its experiences and supporting measurement results within the action group. This sharing facilitates a collaborative learning environment. Action group learnings are also documented and shared with interested medical groups within the collaborative.

Currently, action groups may focus on one guideline or a set of guidelines such as hypertension, lipid treatment and tobacco cessation.

The measures associated with these aims are presented as suggested measures. Measures of aim help medical groups determine progress in achieving a particular aim. However, additional approaches may be customized by individual medical groups to ferret out improvement information important to the medical group's individual practice.

Priority Aims and Suggested Measures for Health Care Systems

1. Improve the timeliness of evaluation of patients presenting with chest pain symptoms.

Possible measures of accomplishing this aim:

- a. Percentage of patients with high-risk symptoms of chest pain seen within recommended time frames. (Refer to Screening Algorithm boxes #5-14 in the original guideline document.)
 - b. Percentage of patients with chest pain receiving thrombolytics with a "door to drug time" (time of arrival to time of drug administration) of less than 30 minutes.
 - c. Percentage of patients with chest pain receiving primary angioplasty with a presentation to cath lab time of less than 60 minutes.
2. Increase the success of emergency intervention for patients with high-risk chest pain.

Possible measures of accomplishing this aim:

- a. Percentage of patients with chest pain symptoms in emergency department (ED) receiving early therapy including intravenous fluids, oxygen and a chewable aspirin on arrival.
 - b. Percentage of patients with chest pain symptoms whose ED record shows documented classification, according to the American College of Cardiology (ACC)/American Heart Association (AHA) criteria, of risk for adverse outcome.
3. Improve the diagnostic value of stress tests through their appropriate use in patients with chest pain symptoms.

Possible measures of accomplishing this aim:

- a. Percentage of patients with chest pain symptoms having stress tests with a Duke Score present.
- b. Percentage of patients with chest pain symptoms with normal resting electrocardiogram (ECG) having stress tests with standard exercise treadmill testing (rather than exercise or pharmacologic imaging).
- c. Percentage of patients with left bundle branch block having standard exercise treadmill tests.

Possible Success Measure #1c

Percentage of patients with chest pain receiving thrombolytics with a "door to drug time" (time from presentation to administration of drug) of less than 30 minutes

Population Definition

Patients greater than age 18 presenting to the ED with chest pain symptoms

Data of Interest

Number of patients with chest pain receiving Reteplase, streptokinase or tissue plasminogen activator (tPA) drugs in less than or equal to 30 minutes

Total patients presenting with chest pain

Numerator/Denominator Definitions

Numerator:

All reportable times are rounded to the nearest minute

Streptokinase includes Kabikinase

Tissue plasminogen activator (tPA) includes Activase

Denominator:

Number of patients with chest pain seen in the ED in the measurement period

Method/Source of Data Collection

Identify patients seen in the ED with a diagnosis of chest pain. Medical records can then be reviewed to determine if the patient received thrombolytics in the ED. Of those patients receiving thrombolytics, the time of arrival and time of administration can be used to calculate "door to drug time." A minimum sample of 15-20 randomly selected records should be reviewed for evidence of patients receiving thrombolytics.

Notes

Thrombolytic therapy should be initiated as soon as possible in eligible patients.

Possible Success Measure #2a

Percentage of patients with chest pain symptoms in ED receiving early therapy including intravenous fluids, oxygen and a chewable aspirin on arrival

Population Definition

Patients greater than age 18 presenting to the ED with chest pain symptoms

Data of Interest

Number of patients with chest pain symptoms receiving early therapy including intravenous fluids, oxygen and a chewable aspirin on arrival in ED

Total number of patients seen in ED with chest pain symptoms

Numerator/Denominator Definitions

Numerator:

Number of patients with chest pain symptoms in ED receiving early therapy including intravenous fluids, oxygen and a chewable aspirin on arrival

Denominator:

Number of patients with chest pain seen in ED

Method/Source of Data Collection

Identify patients seen in the ED with a diagnosis of chest pain. Medical records can then be reviewed to determine if the patient received chewable ASA on arrival in the ED. A minimum sample of 15-20 randomly selected records should be reviewed for evidence of the patient receiving chewable ASA.

Time Frame Pertaining to Data Collection

It is suggested that data is collected monthly.

Notes

For patients arriving in the ED complaining of chest pain, institution of stabilizing therapy, including chewable ASA for suspect anginal pain, prior to completing history or physical is appropriate and often necessary.

Possible Success Measure #3a

Percentage of patients with chest pain symptoms having stress tests with the Duke score present

Population Definition

Patients with a diagnosis of chest pain who receive a stress test. This measure would be pertinent to medical groups with direct control over the process that produces its treadmill stress tests.

Data of Interest

Number of treadmill reports with the Duke treadmill score present

Total number of stress tests reviewed of patients with chest pain symptoms

Numerator/Denominator Definitions

Numerator:

Number of treadmill reports with the Duke score on the report as it is received

Denominator:

Total number of stress tests reviewed for patients with a diagnosis of chest pain

Method/Source of Data Collection

Identify patients who have a diagnosis of chest pain. Medical records can then be reviewed and the treadmill stress test report examined. A minimum sample of 15 randomly selected test reports should be reviewed to determine if the Duke treadmill rating score is contained in the report.

Time Frame Pertaining to Data Collection

It is suggested that data is collected monthly.

Notes

The Duke treadmill risk rating score is the only validated method available to stratify patient risk based on treadmill test results. This measure is intended to be used ONLY by medical groups who have direct control over the treadmill reporting system.

Probing Measures

1. Look at the ways various physicians report using the Duke treadmill risk rating score in their practice. Identify where there is an opportunity for further education about using the score.
2. Investigate the most frequently reported reasons physicians give for not using the Duke treadmill score.
3. Determine the percent of treadmill reports that have the Duke score reported on them.

Systems Approaches to Implementation for this Guideline

1. Hospitals should consider developing and implementing critical pathways and standing orders to accomplish rapid evaluation and treatment of chest pain.
2. A process should be in place for the patient and family that will rapidly orient them to the suspected diagnosis, ED and admission process and other treatment measures to be considered. This could include both caregiver face-to-face interactions with the patient and family as well as teaching tools in written form.
3. Clinics should have a process in place for a patient to be referred for emergency intervention via 911, or be seen in the clinic the same day, within 72 hours, or as an elective clinic evaluation based upon the presence of high-risk symptoms and duration.
4. A process should be in place to ensure that treadmill test results are consistently reported by the Duke treadmill score, based on the Bruce protocol.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Institute For Clinical Systems Improvement (ICSI). Diagnosis of chest pain. Bloomington (MN): Institute For Clinical Systems Improvement (ICSI); 2002 Oct. 50 p.

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Not applicable: The guideline was not adapted from another source.

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GUIDELINE DEVELOPER(S)

Institute for Clinical Systems Improvement - Private Nonprofit Organization

GUIDELINE DEVELOPER COMMENT

Organizations participating in the Institute for Clinical Systems Improvement (ICSI): Affiliated Community Medical Centers, Allina Medical Clinic, Altru Health System, Aspen Medical Group, CentraCare, Columbia Park Medical Group, Community-University Health Care Center, Dakota Clinic, ENT SpecialtyCare, Fairview Health Services, Family HealthServices Minnesota, Family Practice Medical Center, Gateway Family Health Clinic, Gillette Children's Specialty Healthcare, Grand Itasca Clinic and Hospital, HealthEast Care System, HealthPartners Central Minnesota Clinics, HealthPartners Medical Group and Clinics, Hutchinson Area Health Care, Hutchinson Medical Center, Lakeview Clinic, Mayo Clinic, Mercy Hospital and Health Care Center, MeritCare, Minnesota Gastroenterology, Montevideo Clinic, North Clinic, North Memorial Care System, North Suburban Family Physicians, Northwest Family Physicians, Olmsted Medical Center, Park Nicollet Health Services, Pilot City Health Center, Quello Clinic, Ridgeview Medical Center, River Falls Medical Clinic, RiverWay Clinics, Saint Mary's/Duluth Clinic Health System, St. Paul Heart Clinic, Southside Community Health Services, Stillwater Medical Group, SuperiorHealth Medical Group, University of Minnesota Physicians

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GUIDELINE COMMITTEE

Cardiovascular Steering Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

In the interest of full disclosure, ICSI has adopted a policy of revealing relationships work group members have with companies that sell products or services that are relevant to this guideline topic. It is not assumed that these financial interests will have an adverse impact on guideline content. They simply are noted here to fully inform users of the guideline.

All work group members: none declared.

GUIDELINE STATUS

This is the current release of the guideline.

An update is currently in progress.

The revised guideline is scheduled to be available at the end of 2003.

GUIDELINE AVAILABILITY

Electronic copies: Available from the [Institute for Clinical Systems Improvement \(ICSI\) Web site](#).

Print copies: Available from the Institute for Clinical Systems Improvement, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org; e-mail: icsi.info@icsi.org.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Diagnosis of chest pain. In: ICSI pocket guidelines. April 2002 edition. Bloomington (MN): Institute for Clinical Systems Improvement, 2002 Mar pp. 72-81.
- Cardiac stress test supplement. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2001 Oct. 24 p. See the [National Guideline Clearinghouse \(NGC\) summary](#).

Print copies: Available from Institute for Clinical Systems Improvement, 8009 34th Avenue South, Suite 1200, Bloomington, MN 55425; telephone, (952) 814-7060; fax, (952) 858-9675; Web site: www.icsi.org; e-mail: icsi.info@icsi.org.

PATIENT RESOURCES

None available

NGC STATUS

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